UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/736,686	12/17/2003	Xinwu Chen	02964.002543	4140

5514 7590 08/13/2008

FITZPATRICK CELLA HARPER & SCINTO
30 ROCKEFELLER PLAZA
NEW YORK, NY 10112

EXAMINER	
NEWMAN, MICHAEL A	
ART UNIT	PAPER NUMBER
2624	
MAIL DATE	DELIVERY MODE
08/13/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/736,686	CHEN ET AL.	
	Examiner	Art Unit	
	MICHAEL A. NEWMAN	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *30 May 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,5,8,10,11 and 19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,5,8,10,11 and 19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *17 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. The amendment received on May 30th, 2008 has been entered.

2. In view of the amendment to the claims, the amendment to claims 1, 10 and 19 is acknowledged. Claims 3, 4, 6, 7, 9, 12 - 18 and 20 were previously cancelled.

3. In view of the amendment to claim 10, the objection to the claim is withdrawn.

Response to Arguments

4. Applicant's arguments, see pages 6 – 8 of the Remarks, filed on May 30th 2008, with respect to the rejection(s) of claim(s) 1, 10 and 19 under 35 U.S.C. 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of new interpretation of the previously cited prior art.

a. In pages 6 and 7 of the Remarks, regarding the 35 U.S.C. 103 rejection of claim 1 over Suzuki (U.S. Patent No. 5,859,921), "Suzuki", Ando (U.S. Patent No. 5,008,946), "Ando" and Toh (U.S. Patent No. 6,257,722), "Toh"; Applicant's Representative submits that Suzuki determining a region based on candidate eye areas that were previously extracted, as required by step "c)" of claim 1. Specifically, Applicant's Representative submits that Suzuki only discloses setting an eye searching area, nominating eye candidate *band* areas within the eye searching area and using the eye candidate *band* areas to determine eye candidate areas. Therefore, the eye candidate *band* areas, which were

interpreted as the “regions” in the previous Office Action, are used to detect the candidate eye areas and not to judge whether a real eye has been found. In light of these remarks and the further amendment of the claims, the Examiner has reconsidered the teachings of Suzuki. Initially, the term "candidate eye area" is being interpreted as simply an area that could be an eye. As such the Examiner submits that the step of "analyzing the image and getting a candidate eye area" is taught by Suzuki as extracting characteristic feature areas of the face such as eyebrows, eyes, nares, etc. from the binary image (See Col. 19 lines 65 - 67). Further, the steps of defining eye searching area, candidate band areas and finally eye candidate areas, correspond to the step of "determining a region based on the candidate eye area", wherein the eye candidate area in Suzuki correspond to the region encompassing the candidate eye area. At this point, Suzuki carries out verification based on the eye candidate area using the eye evaluation functions discussed in the previous Office Action, to determine whether the originally extracted characteristic feature inside of the eye candidate area corresponds to an eye or not. Clearly, the region is based on, and encompasses, a candidate eye area extracted from the image, and the region is used to verify whether the candidate eye area is an eye or not. However, as state in the previous Office Action, Suzuki does not teach the specifics of such a verification as recited in steps d) – f) of the claim. Ando was applied to teach them.

b. In pages 8 and 9 of the Remarks, also regarding the 35 U.S.C 103 rejection of claim 1 over Suzuki, Ando and Toh; Applicant's Representative submits that the combination does not result in claimed limitations. Specifically, Applicant's Representative submits that Ando's technique of determining an area's size, counting dark areas, determining a ratio of the two measures, and comparing the ratio with a threshold is used for iteratively setting a threshold for binarizing pixels and not for detecting a pupil directly. As such, substituting the technique of Ando for the eye evaluation function method of Suzuki would still not result in determining whether or not a feature in a candidate eye area is a real eye area or not as claimed. In light of these remarks, the Examiner has reconsidered the teachings of Ando and the language recited in the claims. As correctly noted by Applicant's Representative, Ando teaches detecting pupils by looking for black regions having the dimensions expected for a human eye. Specifically, after a region S_d has been determined, the number of black pixels, BPN, in the region is counted for each horizontal line (See Col. 19 lines 5 – 11). The maximum detected number of black pixels is saved in a maximum black pixel number register, MXL (See Col. 19 lines 36 – 41). The vertical width of the region (i.e. height) is also calculated and stored in a vertical width register, W (See Col. 19 lines 51 – 53). Finally, a check is done to determine whether the ratio MXL/W is equal to or less than a predetermined value. If the condition is satisfied, the pupil is regarded as being detected (See Col. 19 lines 59 – 64). In this case, the region's height is reasonably regarded as a size of the region.

Furthermore, since the claim only requires detecting dark areas in the region and counting the number, there is no explicit requirement that *all* the dark areas are counted. Therefore, Ando's teaching of detecting and counting all the dark pixels, but only storing the maximum number of dark pixels per line, is sufficient. The Examiner *respectfully* submits that the technique in Ando does result in detecting a real eye and can be easily applied to the eye candidate areas extracted by Suzuki.

In view of this reasonable interpretation of the claims and the prior art, the Examiner *respectfully* insists that the rejections under 35 U.S.C. 103, set forth below, are proper.

Claim Rejections - 35 USC § 103

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 1, 2, 5, 8, 10, 11 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (U.S. Patent No. 5,859,921) in view of Ando (U.S. Patent No. 5,008,946). Hereinafter referred to as Suzuki and Ando respectively.

a. Regarding claims 1, 10 and 19, Suzuki teaches a human eye detection method and apparatus comprising: an input unit that inputs an image **(Suzuki Fig. 1 – element 1 and Fig. 2 – step 1)**; and a processor **(Suzuki Fig. 1 element b)** that (i) analyzes the image to obtain a candidate eye area **(Suzuki Col. 19 lines 65 – 67) [Note that the characteristic feature areas of the face are candidate eye areas]**; (ii) determines a region in the image of the candidate

eye area, the region based on the candidate eye area being a region encompassing the candidate eye area and the center of said region being the center of the candidate eye area **(Suzuki Col. 20 lines 3 – 49) [Note that the resulting 'eye candidate areas' are the regions, which encompass and are centered about each characteristic feature – see Fig. 8.]**. Suzuki goes on to teach an eye area function (EFV) to validate the candidate eye regions **(Suzuki Col. 21 lines 26 – 34)**, and using the output to judge whether or not the candidate area is a real eye area. However, **Suzuki fails to teach** an eye-evaluation process which (iii) calculates the region's size S, (iv) detects dark areas in the region and determines the total count N of dark areas in the neighborhood region, (v) and determines whether or not the candidate eye area is a real eye area by comparing the ratio N/S to a predetermined first threshold, wherein if the ration N/S is smaller than the first threshold, the candidate eye area is judged to be a real eye area, else the candidate eye area is judged to be a false eye area. **Pertaining to the same field of endeavor, Ando teaches a pupil detection system in which the validity of a detected pupil regions are determined by looking for black regions having the dimensions expected for a human eye. Specifically, after a region around a dark area S_d has been determined, the number of black pixels, BPN, in the region is counted for each horizontal line (Ando Col. 19 lines 5 – 11). The maximum detected number of black pixels is saved in a maximum black pixel number register, MXL (Ando Col. 19 lines 36 – 41). The vertical width of the region (i.e.**

height) is also calculated and stored in a vertical width register, W (Ando Col. 19 lines 51 – 53). Finally, a check is done to determine whether the ratio MXL/W is equal to or less than a predetermined value. If the condition is satisfied, the pupil is regarded as being detected (Ando Col. 19 lines 59 – 64). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Suzuki by replacing the eye evaluation function, EFV, generating step with the valid pupil detection method taught by Ando, and to use Ando's dark-pixel-counting detection method to judge whether or not each of Suzuki's characteristic feature areas contains a pupil and thus corresponds to a valid/real eye area. Such a modification would eliminate the need to evaluate the product of two auxiliary functions, EFV1 and EFV2 (Suzuki Fig. 9 step 609) thus resulting in a simplified eye-region verification process.

- Regarding claim 19, Suzuki is silent as to whether the implementation of the aforementioned steps is as program code or discrete logic elements; however, Ando teaches the implementation of the eye detection method using a microprocessor with corresponding ROM and RAM **(Ando Fig. 1 elements 8,9 and 10) [See also Col. 7 lines 27 – 30]**. Such microprocessors clearly rely on coded instructions to perform the desired operations. **Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to realize the steps taught by Suzuki and Ando by way of processor-executable program code in order to reduce cost and speed development**

by eliminating multiple discrete components as well as exploiting the flexibility of a programmable device.

b. Regarding claim 2, Suzuki in view of Ando teach all the limitations of the independent claim 1 as set forth in the 103 rejection of claim 1 above. **Suzuki also teaches** determining candidate face areas on the basis of said judged candidate eye area obtained from said step f **(Suzuki Col. 7 lines 33 – 40)**.

c. Regarding claims 5 and 11, Suzuki in view of Ando teach all the limitations of the independent claims 1 and 10 and dependent claim 2 respectively as set forth in the 103 rejection of claims 1, 2 and 10 above. **Suzuki also teaches** correctly obtaining characteristic features of a face image by converting it into a binary image **(Suzuki Col. 3 lines 25 – 28)**. In the pupil detection method taught by Ando used to modify Suzuki, **Ando also teaches** that the region surrounding the eye, 'S_d' is also binarized using a threshold value so as to easily separate regions whose grey levels change rapidly (i.e. potential eyes) from the background within the region **(Ando Col. 4 lines 33 – 42)**. **Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to binarize both the entire image and the candidate eye regions by thresholding their grey scale values in order to easily differentiate dark regions (potential eye regions) from background regions while avoiding the need for additional/redundant processing steps for each.**

d. Regarding claim 8, Suzuki in view of Ando teach all the limitations of the independent claim 1 and the dependent claim 2 as set forth in the 103 rejection of claims 1 and 2 above. In the pupil-detection method used to modify Suzuki, **Ando also teaches** as part of the method, a threshold or comparison value, K, calculating step prior to the ratio comparison **(Ando Col. 20 lines 59 – 63)**. **Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have a variable threshold or comparison value calculation so as to optimize the pupil detection criteria based on individual input image.**

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

8. Gerhardt et al. (U.S. Patent No. 5,481,622) teaches an eye tracking system in which statistics of detected blobs (area, width, etc) are used to determine if they are valid eye regions.

9. Durnell (U.S. Patent No. 7,391,887) teaches an eye tracking system in which parameters assigned to detected blobs are compared with certain validity criteria. Specifically, Durnell teaches the use of “fill factor” or ratio of blob size to bounding box size.

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL A. NEWMAN whose telephone number is (571)270-3016. The examiner can normally be reached on Mon - Thurs from 9:30am to 6:30pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Samir A. Ahmed can be reached on (571) 272-7413. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

M.A.N.

/Samir A. Ahmed/
Supervisory Patent Examiner, Art Unit 2624